Carbon Offsets Markets 101

Introduction to Offset Markets

- Compliance versus Voluntary
- Size
- Types of programs, standards
- Buyers, Sellers, Location, Project Types

Quality of Offsets

- Additionality & Baselines
- Methodology Comparison:
- CDM, CCX, GE AES

Offsets in Context of Climate Mitigation

Carbon Offsets Markets 101

SEI STOCKHOLM ENVIRONMENT INSTITUTE

SEI is an independent, international research institute.

We do applied research: modeling, policy analysis and capacity building.

We provide information to decision makers that bridges science and policy in the field of environment and development.

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Why Offsets Work

Climate Change: non-localized

Offset Markets

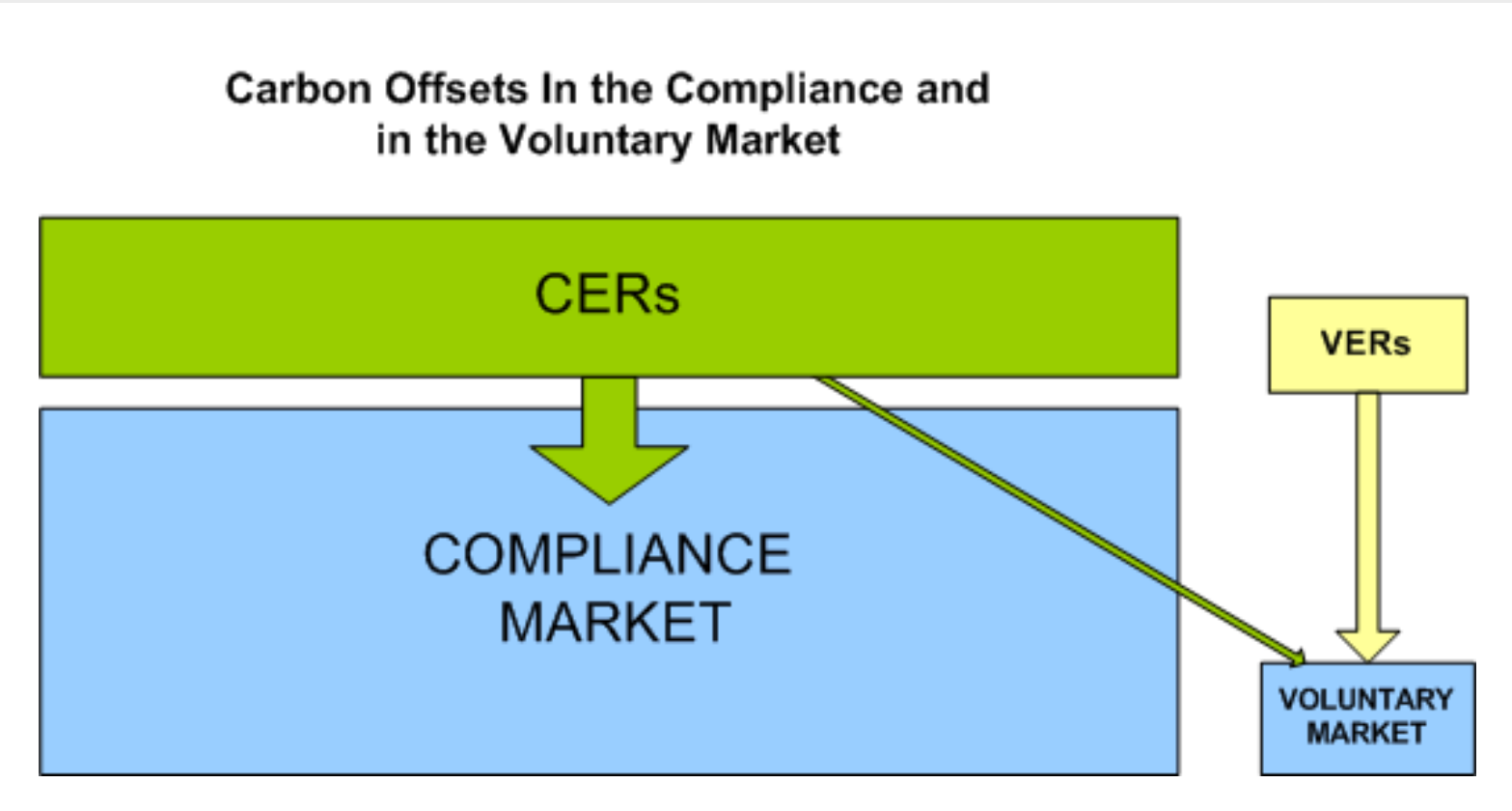
Carbon Markets

Compliance Market:

Cap-and-trade

Voluntary Market

Carbon Markets

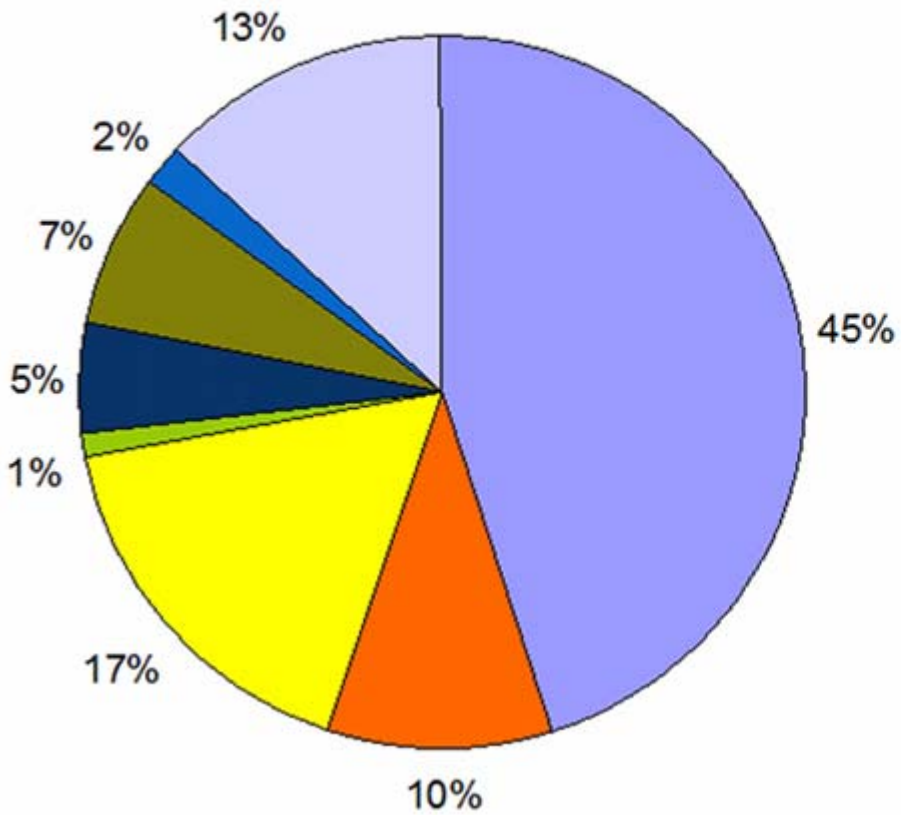


Mandatory Systems

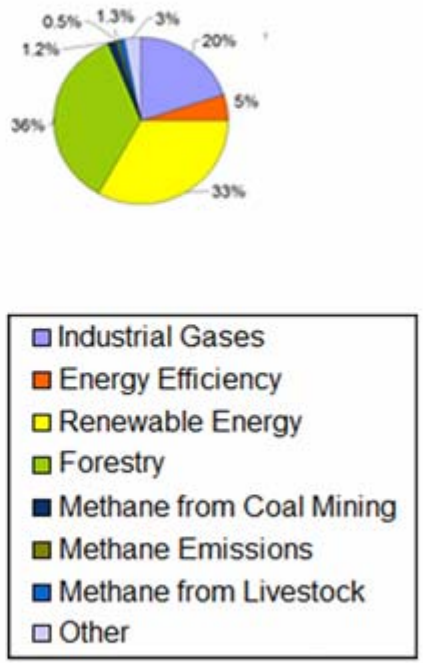
International Offset Mechanisms		Coal Methane	Methodology
	Clean Development Mechanism (CDM)	yes	CDM
	Joint Implementation (JI)	yes	CDM
Mandatory Cap and Trade Systems (Offset Features)			
	EU Emissions Trading System (EU-ETS)	Yes	CDM/JI
	Australian Carbon Pollution Reduction Scheme	under development	
	Canada's Offset System for Greenhouse Gases	No	
	New South Wales Greenhouse Gas Reduction Scheme	No	
	Regional Greenhouse Gas Initiative	No	
	Western Climate Initiative	under development	
Other Mandatory Systems (Offset Features)			
	Alberta-Based Offset Credit System	No	
	State Power Plant Rules (OR, WA, MA)	No	

Size of Carbon Markets

Kyoto Projects (CDM and JI)
Total Volume in 2006: 466 $MtCO_2e$

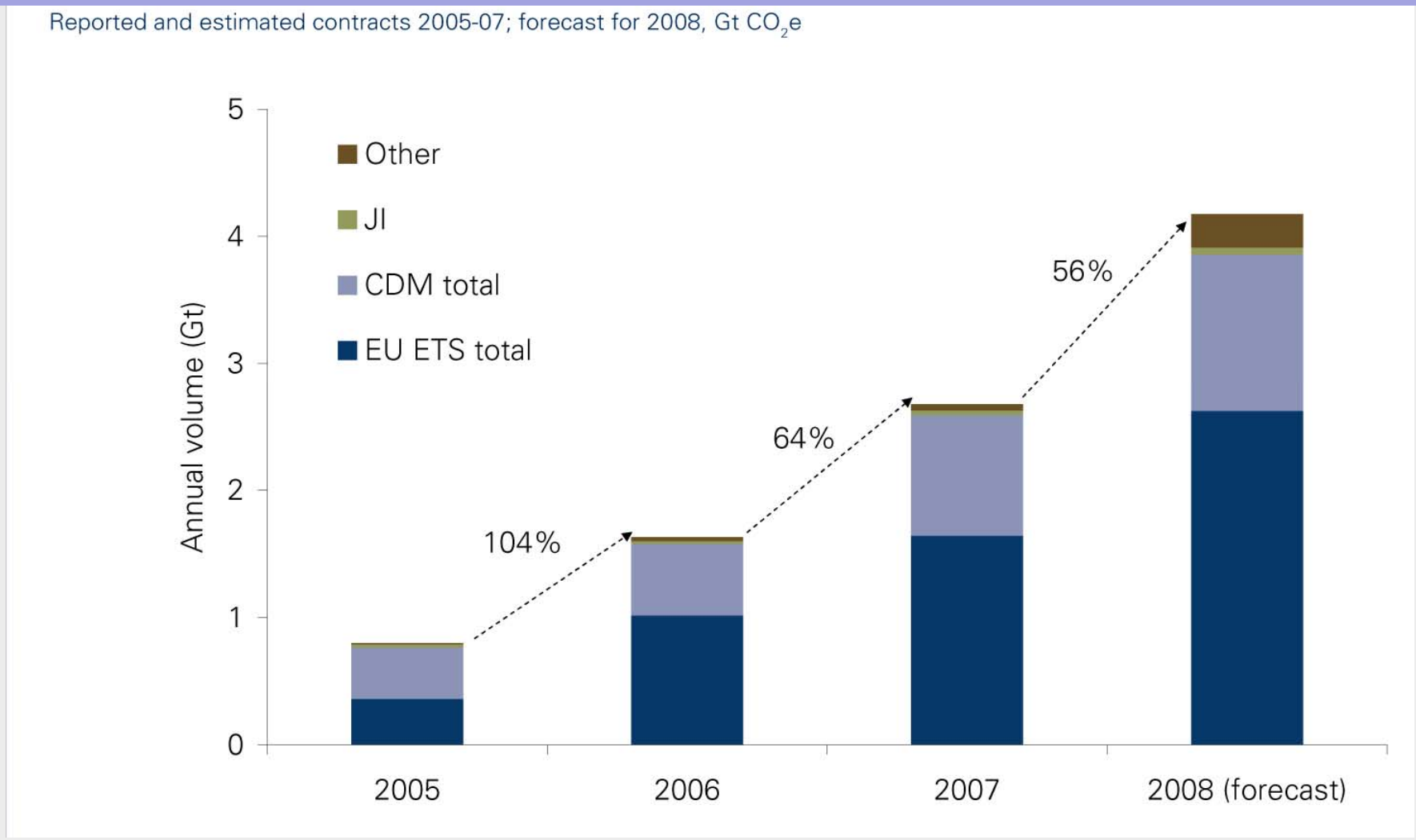


Voluntary Offset Projects (CDM and JI)
Total Volume in 2006: 13 $MtCO_2e$
(excluding CCX transactions of 10.3 $MtCO_2e$)



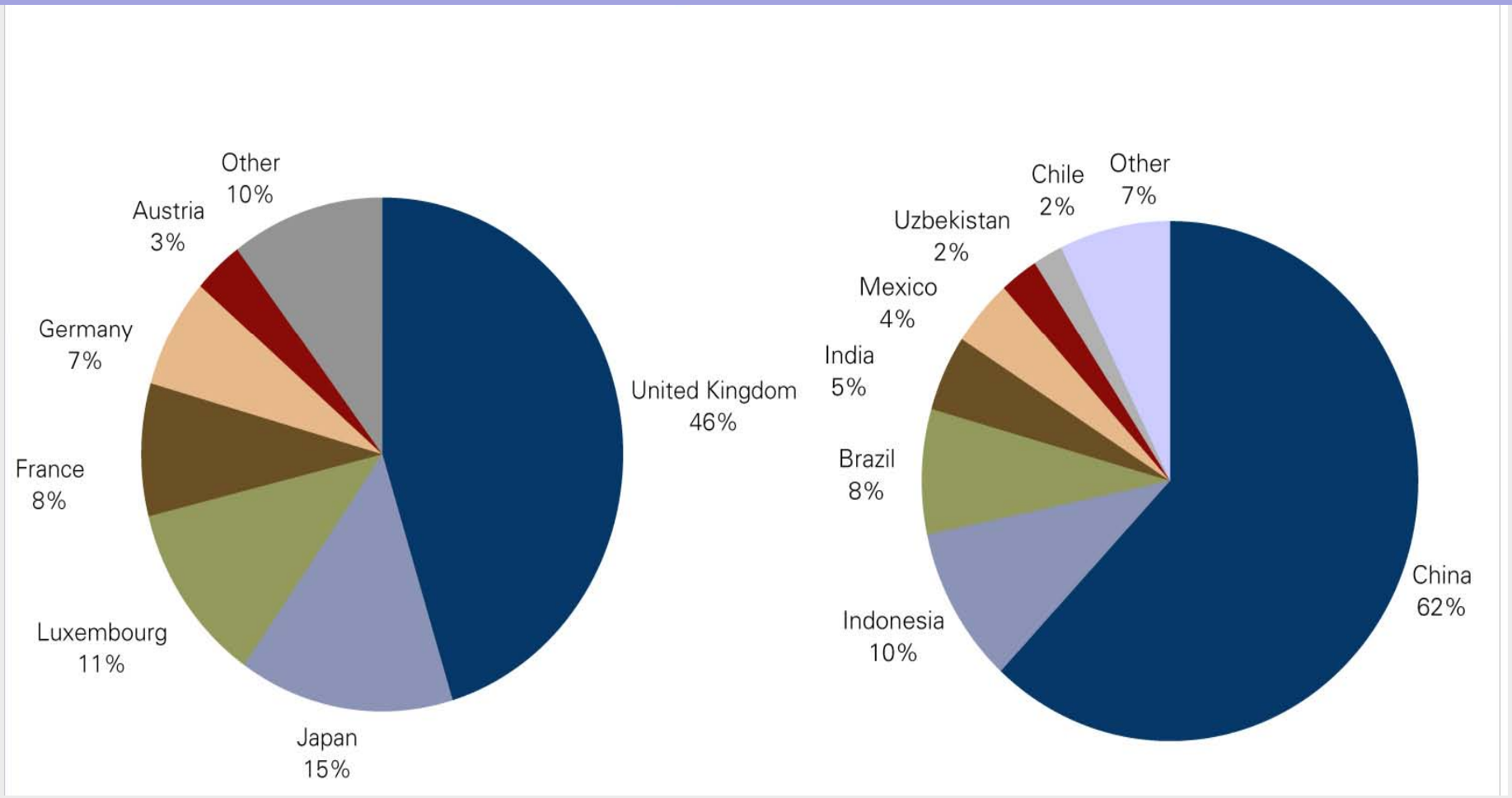
(Source, Capoor, 2007 & Hamilton, 2007)

Offset Trading Volumes



Source: PointCarbon, *Post 2012 is now,* 2008

CDM Buyers (left) & Sellers (right)



Source: PointCarbon, *Post 2012 is now,* 2008

CDM Project Types in the Pipeline (as of Oct 08)

Type	number		CERs/yr (000)		2012 CERs (000)		CERs Issued (000)	
Hydro	1037	26%	100439	18%	444439	16%	6702	3%
Biomass energy	609	15%	36580	7%	194405	7%	10490	5%
Wind	539	14%	43793	8%	213822	8%	6830	4%
EE own generation	366	9%	55896	10%	268004	10%	8280	4%
Landfill gas	299	8%	47054	9%	257239	9%	4987	3%
Biogas	243	6%	11543	2%	57955	2%	1031	1%
Agriculture	216	5%	8209	2%	50614	2%	3430	2%
EE Industry	169	4%	6399	1%	32441	1%	616	0%
Fossil fuel switch	132	3%	43897	8%	207202	7%	1261	1%
N2O	65	2%	48195	9%	257722	9%	39855	20%
Coal bed/mine methane	58	1%	26023	5%	125722	5%	638	0%
EE Supply side	42	1%	9666	2%	28817	1%	159	0%
Cement	38	1%	6806	1%	41342	1%	923	0%
Fugitive	29	1%	10690	2%	63733	2%	5153	3%
Afforestation & Reforestation	27	1%	1780	0%	13646	0%	0	0%
Solar	23	1%	641	0%	2816	0%	0	0%
HFCs	22	1%	83168	15%	506050	18%	103874	53%
Geothermal	13	0%	2457	0%	13775	0%	318	0%
EE Households	11	0%	456	0%	2092	0%	0	0%
EE Service	8	0%	84	0%	393	0%	0	0%
PFCs	8	0%	1121	0%	4785	0%	0	0%
Transport	7	0%	711	0%	3938	0%	129	0%
Energy distrib.	4	0%	129	0%	1053	0%	0	0%
Tidal	1	0%	315	0%	1104	0%	0	0%
CO2 capture	1	0%	7	0%	29	0%	0	0%
Total	3967	100%	546058	100%	2793136	100%	194679	100%

Source: www.cdmpipeline.org

Carbon Offsets Under Cap-and-Trade

A hypothetical example: The world: emits 1000 units

Country A emits 800 units

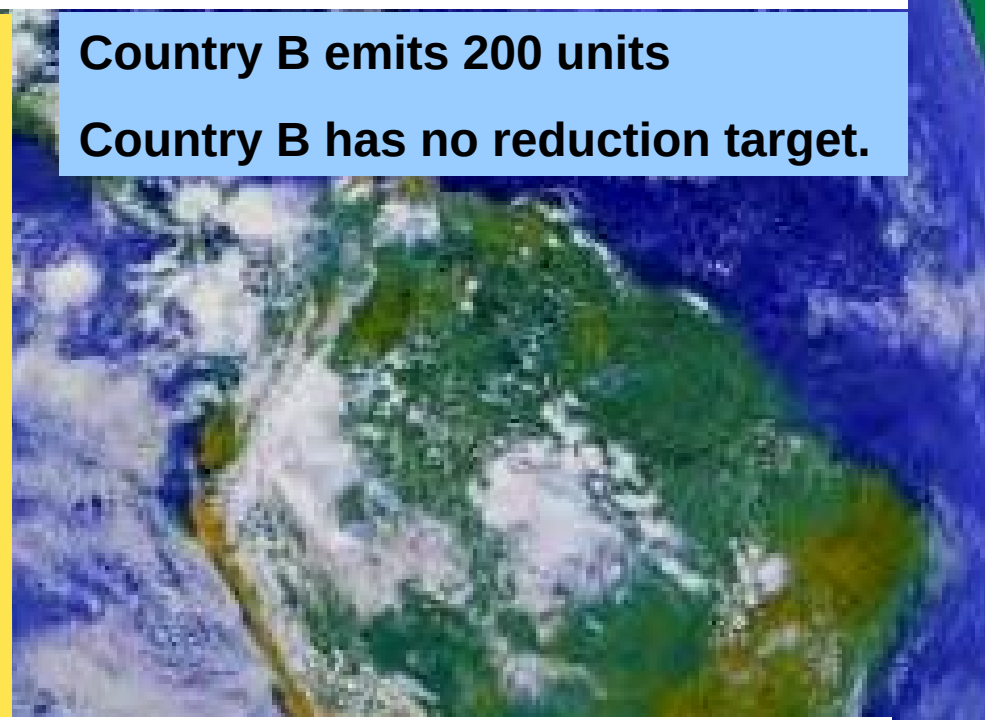
Country A establishes a legally binding cap-and-trade system. Reduction target 20% (160 units less)

Country A does not allow any offsets from country B

Country A has to reduce its emissions at home by 160 units.

Country B emits 200 units

Country B has no reduction target.



Result: Total global emissions will be lowered to 840 units

Carbon Offsets Under Cap-and-Trade

A hypothetical example: The world: emits 1000 units

Country A emits 800 units

Country A establishes a legally binding cap-and-trade system. Reduction target 20% (160 units less)

Country A does allow 20% of its reductions from offsets from country B

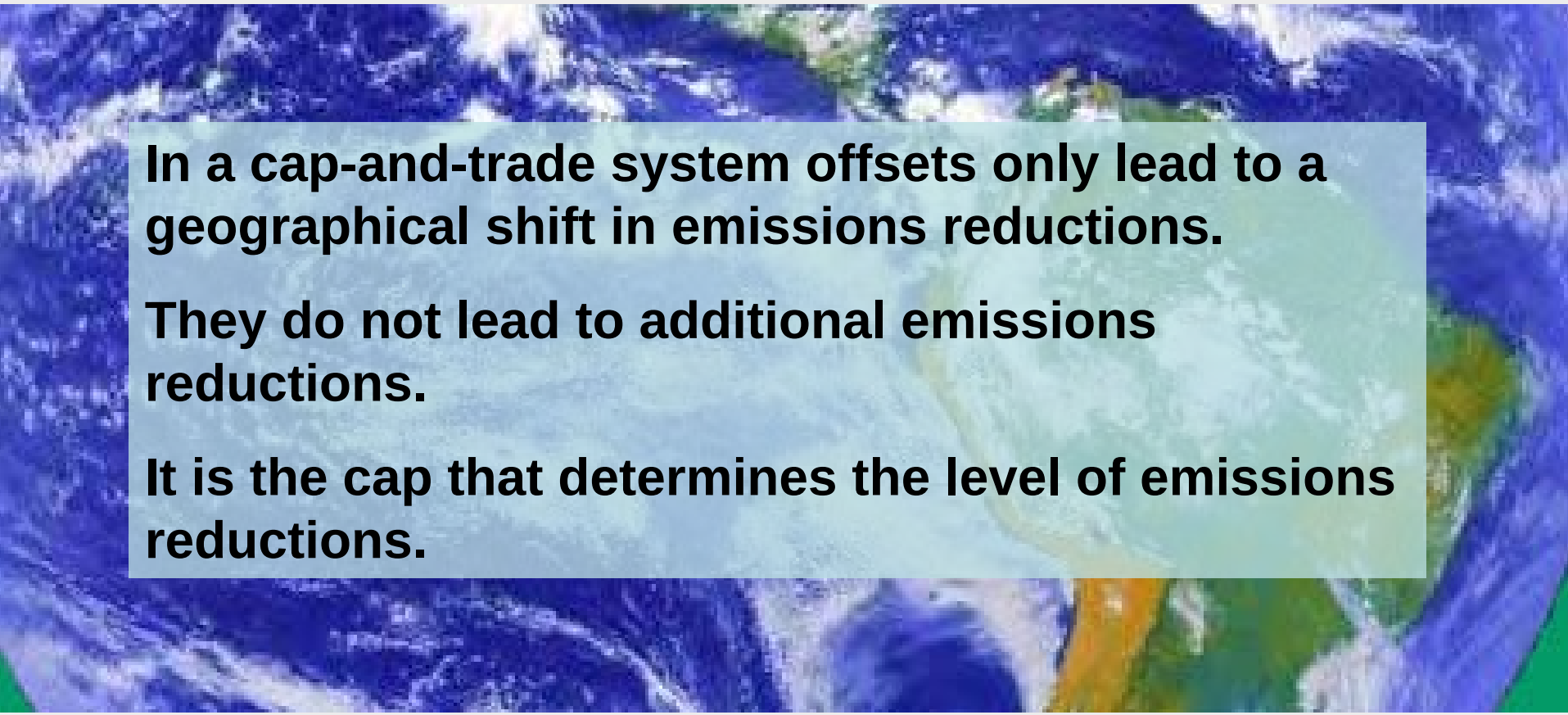
Country A has to reduce its emissions at home by 128 units.

Country B emits 200 units and has no reduction target.

County B has to reduce emissions by 32 units to supply country A with offsets.

Result: Total global emissions are lowered to 840 units

Carbon Offsets Under Cap-and-Trade



In a cap-and-trade system offsets only lead to a geographical shift in emissions reductions.

They do not lead to additional emissions reductions.

It is the cap that determines the level of emissions reductions.

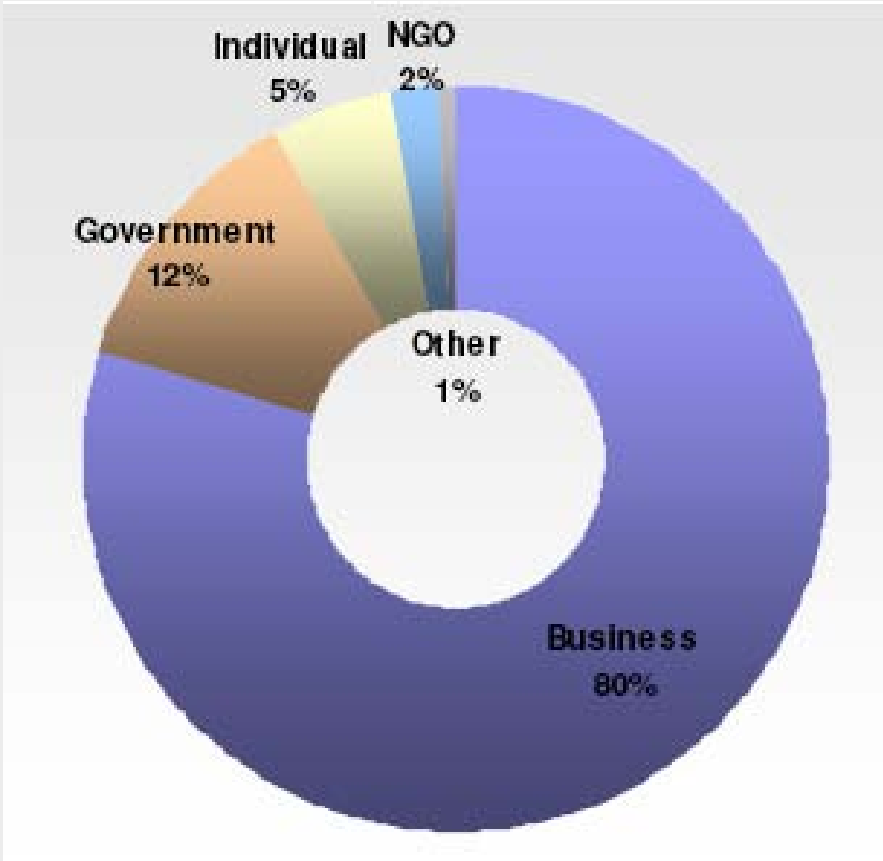
Carbon Offset in the Voluntary Market

No cap; all action is purely voluntary
No unified rules and regulations

Voluntary Programs & Standards

Carbon Offset Funds		Coal Methane	Methodology
	World Bank Carbon Finance Funds	No restrictions	
Voluntary Cap and Trade Systems (Offset Features)			
	Chicago Climate Exchange (CCX)	Yes	CCX
Voluntary GHG Reduction Programs			
	Climate Leaders (US)	No	
	California Climate Action Registry	No	
	Climate Friendly (AU)	No	
Voluntary GHG Accounting Protocols (entity-wide and offset-project-specific)			
	WBSCD/WRI GHG Protocol for Project Accounting	N/A	
	ISO 14064	N/A	
Voluntary Standards for Offset Projects and Retailers			
	Gold Standard	No	
	Voluntary Offset Standard (VOS)	Yes	CDM
	Voluntary Carbon Standard 2007 (VCS 2007)	Yes	CDM
	VER+	Yes	CDM
	Green-e Climate Protocol for Renewable Energy	No	
	Green-e Climate Program	(Yes)	CDM
	Climate, Community & Biodiversity Standards (CCB)	No	
	Plan Vivo	No	
	Social Carbon	No	

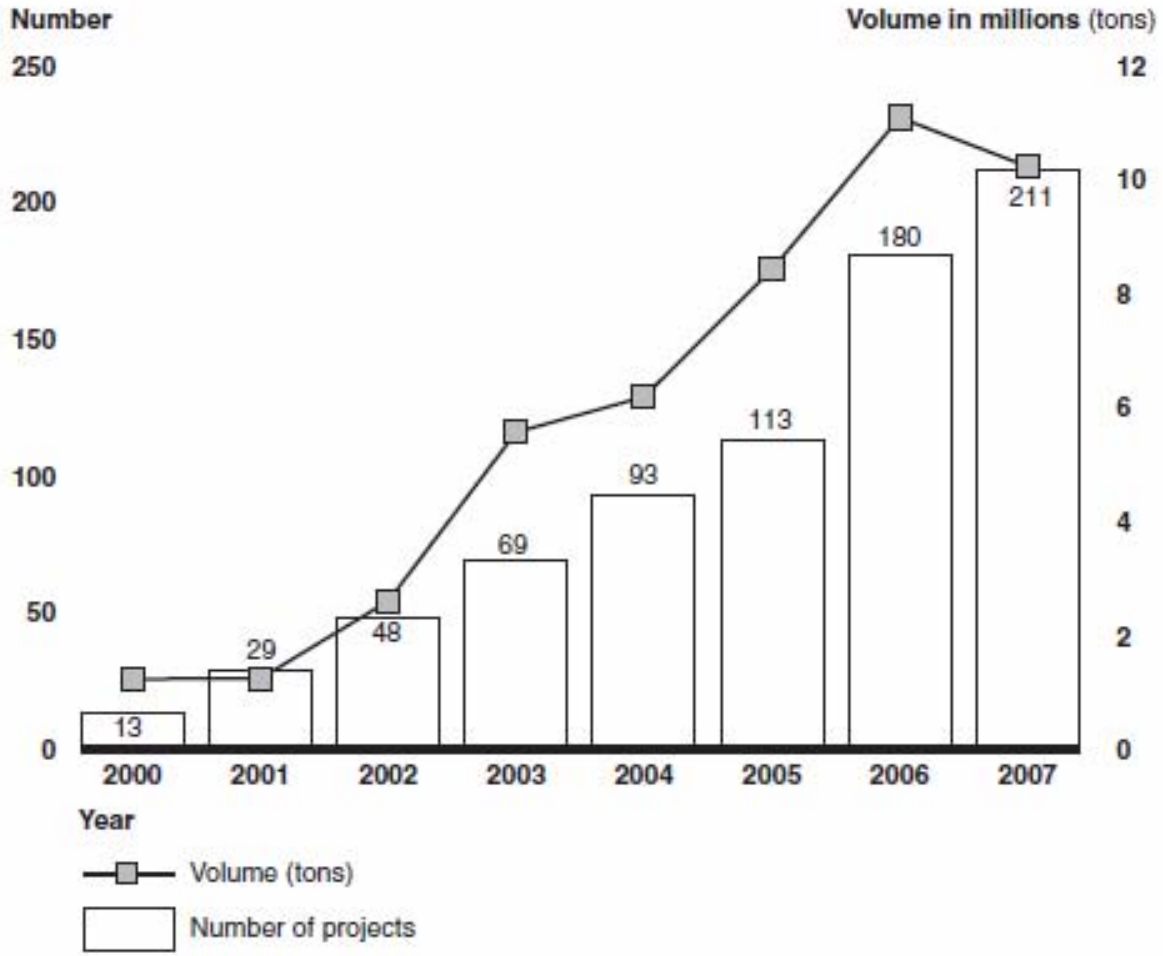
Voluntary Offset Buyers



Ecosystem Marketplace, 2007

US Supply of Offsets 2000-2007

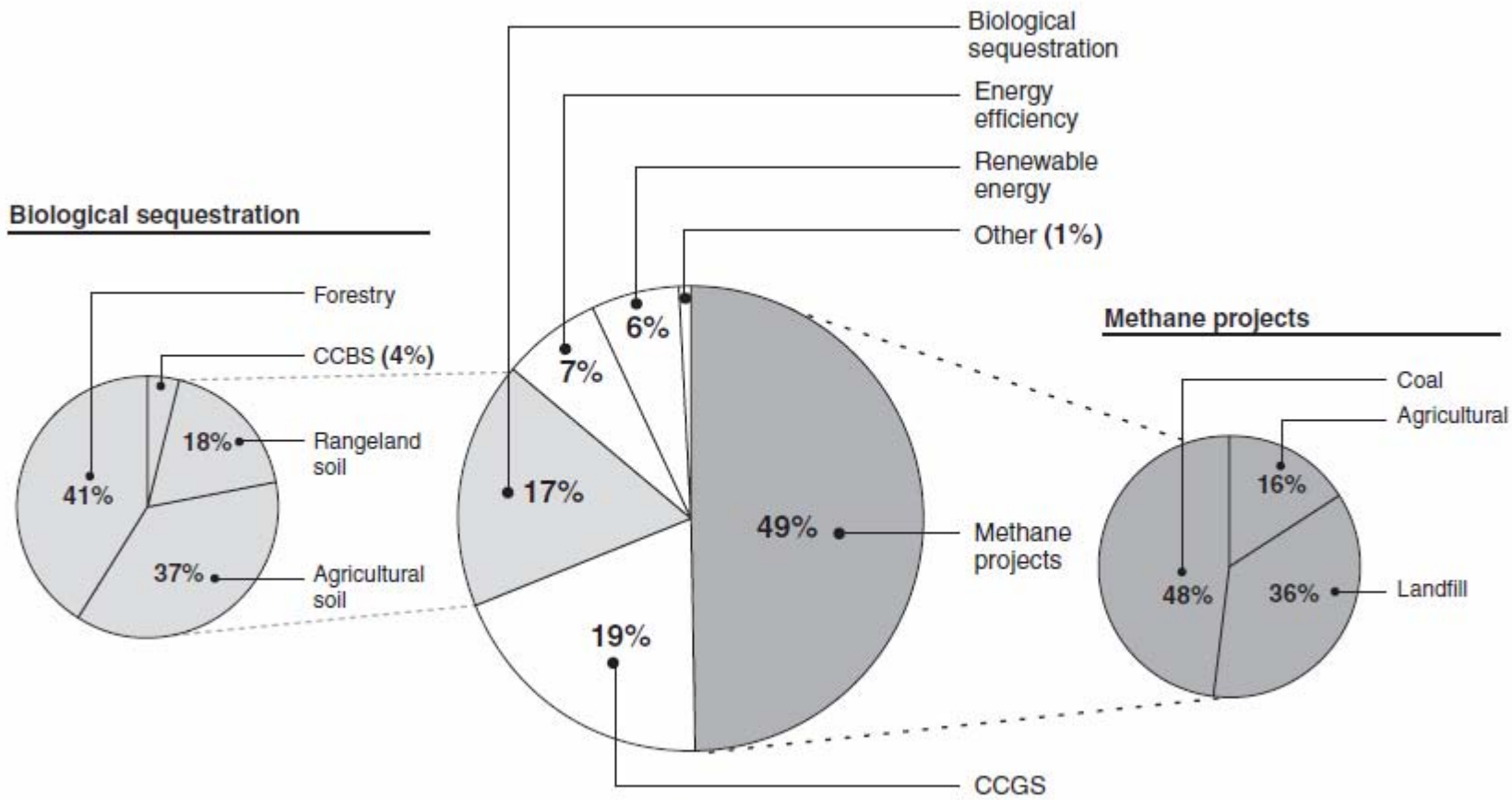
Figure 4: U.S. Supply of Offsets by Volume and Number of Projects from 2000 through 2007



Source: GAO

US Offset Supply by Type of Project in 2007

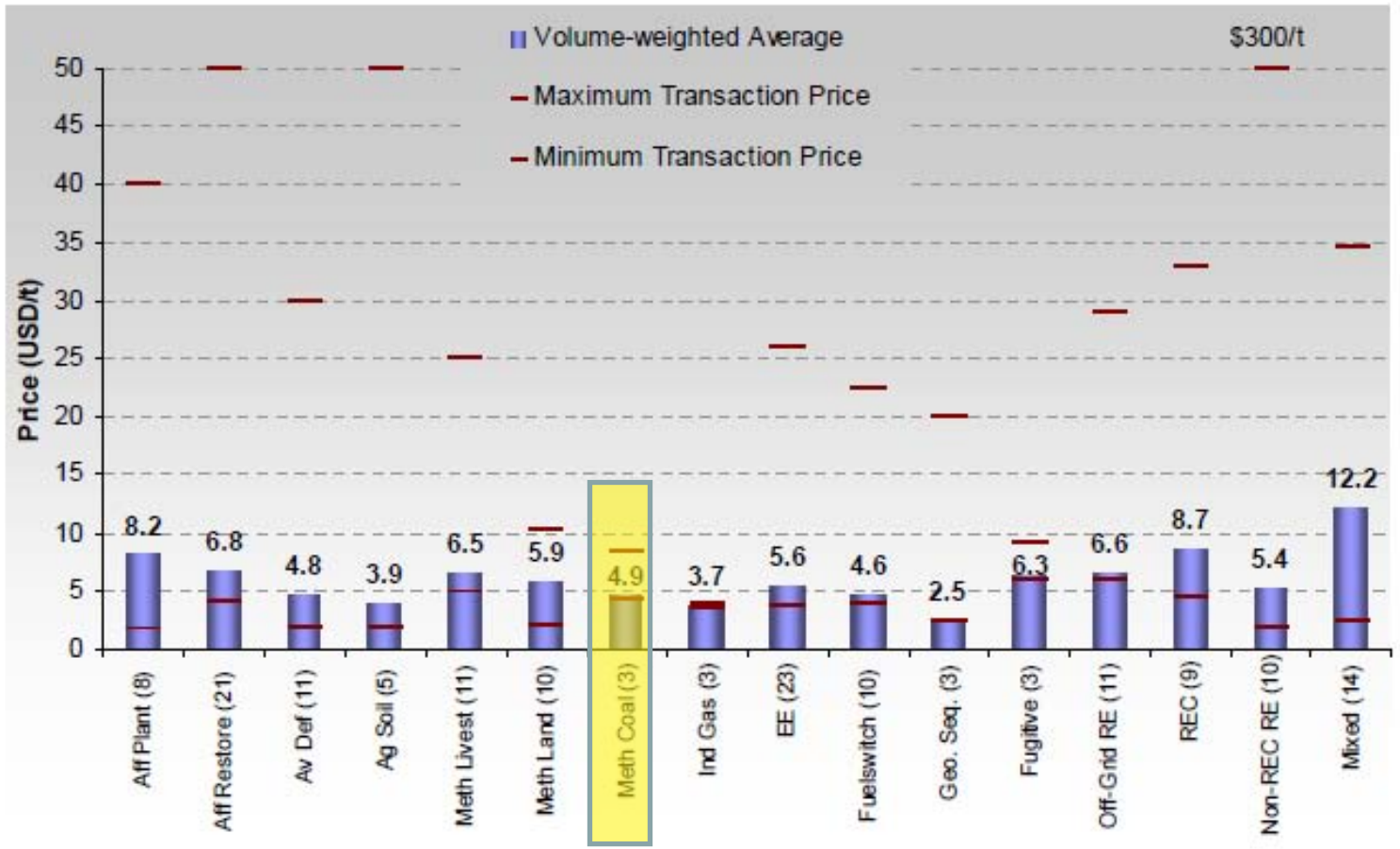
Figure 5: U.S. Offset Supply by Type of Project in 2007



Source: GAO analysis of Point Carbon data.

Notes: CCBS refers to carbon capture and biological storage. Totals may not equal 100 because of rounding.

Voluntary Market: Credit Prices by Project Type, OTC 2007



Source: Ecosystem Marketplace, New Carbon Finance. Note: Numbers in parentheses indicate number of data points. The weighted average prices in this chart are not directly comparable with the price chart in last year's report. This chart shows the weighted average prices across the value chain, whereas last year's chart showed only prices from retailers, which are higher than the value chain average.

Source: Ecosystem Marketplace. 2008.

Quality Of Offsets

Offset Quality

- ✓ Is it ***real?***
- ✓ Is it ***surplus/additional?***
- ✓ Is it ***verifiable?***
- ✓ Is it ***permanent?***
- ✓ Is it ***enforceable?***

Additionality & Baselines

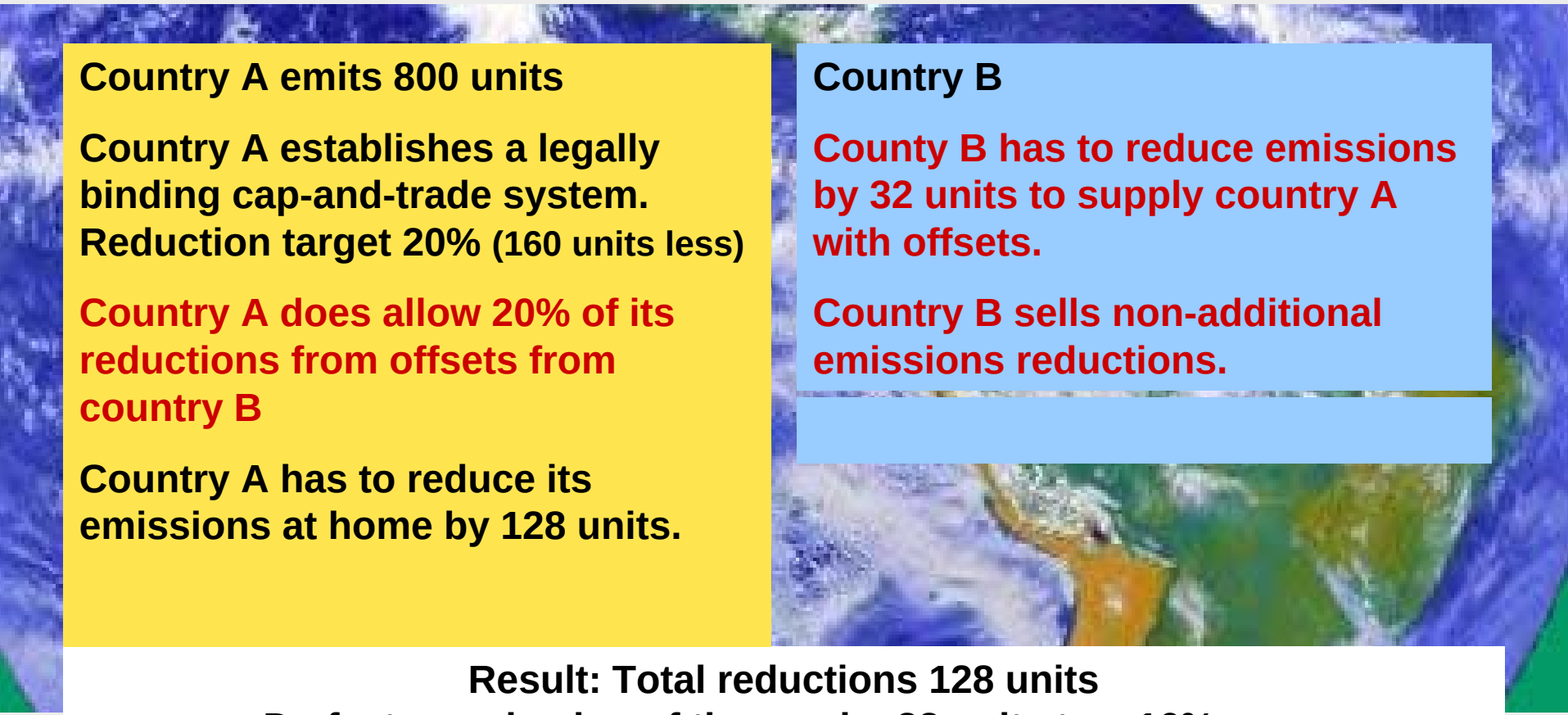
Additionality

Would the activity have occurred, holding all else constant, if the activity were not implemented as an offset project?

Baselines

The baseline scenario is a *hypothetical* scenario of emissions that would have occurred had the activity *not* been implemented as an offset project.

Non-additionality Under Cap-and-Trade



Country A emits 800 units

Country A establishes a legally binding cap-and-trade system. Reduction target 20% (160 units less)

Country A does allow 20% of its reductions from offsets from country B

Country A has to reduce its emissions at home by 128 units.

Country B

County B has to reduce emissions by 32 units to supply country A with offsets.

Country B sells non-additional emissions reductions.

Result: Total reductions 128 units
De-facto weakening of the cap by 32 units to a 16% cap.

Project-based versus Standardized

Project-specific approach

evaluation of individual projects based on one or more additionality tests (commonly based on the “CDM additionality tool”)

Used predominantly by: CDM, JI, VCS, Gold Standard

Issues: Subjective, easily fudged, costly for project developers

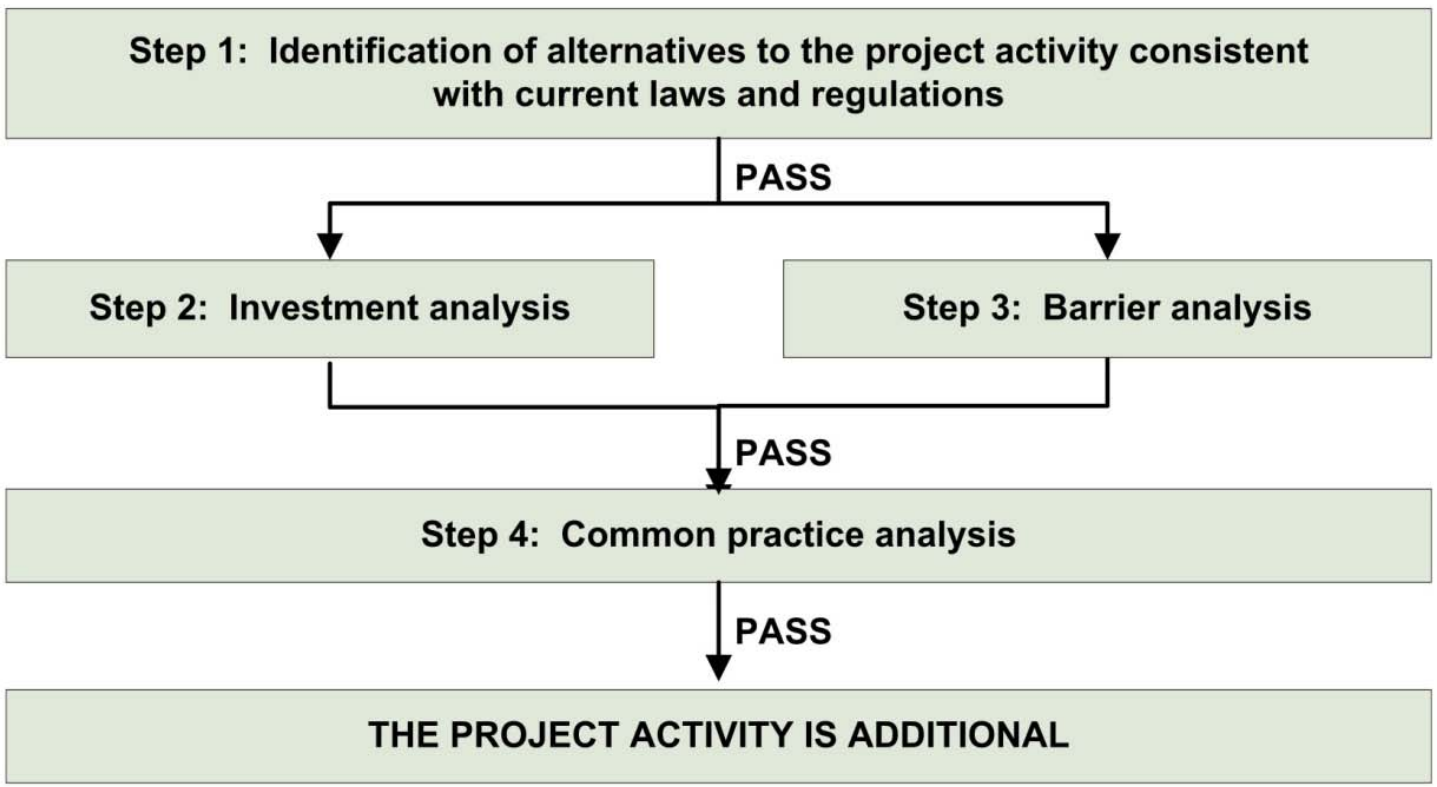
Standardized methods

- performance thresholds (e.g. emission rates defined based on similar activities),
- clearly defined common practice tests (e.g. lower than a specified level of market penetration for similar activities)

Used predominantly by: Climate Leaders, CCAR, CCX, RGGI, NSW GGAS

Issues: free-riders: finding the correct stringency that minimizes free-riders

CDM Additionality Tool



Source: UNFCCC (2004), EB-36 Report, Annex 13

Bottom-up versus Top-down

Top-down programs

provide specific detailed accounting rules upfront.
RGGI's Memorandum Of Understanding and Model Rule spells out project types and methodologies.

Bottom-up programs

provide general guidelines for project GHG accounting and evaluate projects on a case by case basis.
CDM, project types are considered, as submitted by project developers, and approved by administrative body (CDM Executive Board).

Both top-down and bottom-up programs use both project-specific or performance standard approaches to determining baselines.

Non-Additionality: Systemic Problem?

Recent Published Reports

McCully, Patrick, 2008, ***Bad Deal for the Planet: Why Carbon Offsets Aren't Working...and How to Create a Fair Global Climate Accord***, International Rivers, Berkeley
http://tinyurl.com/3w43hq

Haya, Barbara, 2007**, *Failed Mechanism: How the CDM is Subsidizing Hydro Developers and Harming the Kyoto Protocol***, International Rivers, Berkeley
http://tinyurl.com/45w7s9

Schneider, Lambert, 2007, ***Is the CDM fulfilling its environmental and sustainable development objectives? An evaluation of the CDM and options for improvement*****,** WWF, Berlin **http://tinyurl.com/4gv7j8**

Wara MW, Victor DG. 2008. ***A realistic policy on international carbon offsets.*** *Rep. PESD Working Paper #74*, Program on Energy and Sustainable Development, Stanford University, Stanford, CA
http://tinyurl.com/3hth6d

Coal bed Methane Methodology Comparison

Coal Methane Methodologies Comparison

CDM: Approved Consolidated Methodology ACM0008
Consolidated methodology for coal bed methane, coal mine methane and ventilation air methane capture and use for power (electrical or motive) and heat and/or destruction through flaring or flameless oxidation
http://tinyurl.com/22kw4n (all methodologies) and
http://tinyurl.com/4qgrrh (ACM0008)

GE AES Greenhouse Gas Services
Methodology for Coalmine Methane and Abandoned Mine Methane Capture And Destruction Projects
http://tinyurl.com/4rodrm

Chicago Climate Exchange
Coal Mine Methane Project Guideline
http://tinyurl.com/48vcl9

Type of Program

	CDM	CCX Offset Program	GE AES GHG Services
Type of Market	**Compliance**	**Voluntary**	**Voluntary**
Type of Program	**1 of 3 Kyoto Compliance Mechanisms, includes full-fledged GHG Offset Standard**	**Voluntary cap-and-trade program, includes full-fledged GHG Offset Standard**	**Project Developers who developed their own GHG Offset Standard: GHGS is a venture by GE Energy Financial Services and AES Corporation.**

Type of Program

	CDM	CCX Offset Program	GE AES GHG Services
Start Date	after January 1, 2000	after January 1, 1999	operation after January 1, 2000; emissions reductions resulting from after January 21, 2002 are eligible.
Crediting Period	7 years with the option of up to two renewals of 7 years each; or 10 years with no renewal option.	2003-2010	"GHG credits shall have an allowed life prior to expiration equal to that allowed under approved methodologies under the [CDM] or equal to that allowed under applicable local law, whichever is lesser."
3rd Party Verification	Required	Required	"GE AES GHG Services will develop and publish criteria and a process of third-party project verification."
Approval Body	CDM Executive Board	CCX Offset Committee	Third-party Verifier
Registry	Yes	Yes	Will establish minimum criteria for acceptable registries. Will implement a project registration and credit inventory control system.

Project Type, Start Date, Crediting Period

	CDM	CCX Offset Program	GE AES GHG Services
Meth Doc Length	**54p.**	**18p.**	**64p.**
Project Types	**New and existing mining activities.** CH4 flaring, flameless oxidation, utilization to produce electricity, motive power, and/or thermal energy; ER may or may not be claimed for displacing or avoiding energy from other sources.	**New, existing, closed or abandoned mines**. CH4 flaring; utilization to produce electricity, motive power, and/or thermal energy.	**New, existing, closed or abandoned mines.** CH4 flaring; utilization to produce electricity, motive power, and/or thermal energy.
# of Projects	51 in the pipeline (as of October 2008)	30% of CCX offsets sold (2003-2007) (OTC market 6%). (Offsets are commodisized into CFIs.)	No information available

Bottom-up versus Top-down

Top-down programs

provide specific detailed accounting rules upfront.
CDM, project types are considered, as submitted by project developers, and approved by administrative body (CDM Executive Board).

Bottom-up programs

provide general guidelines for project GHG accounting and evaluate projects on a case by case basis.
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Baselines

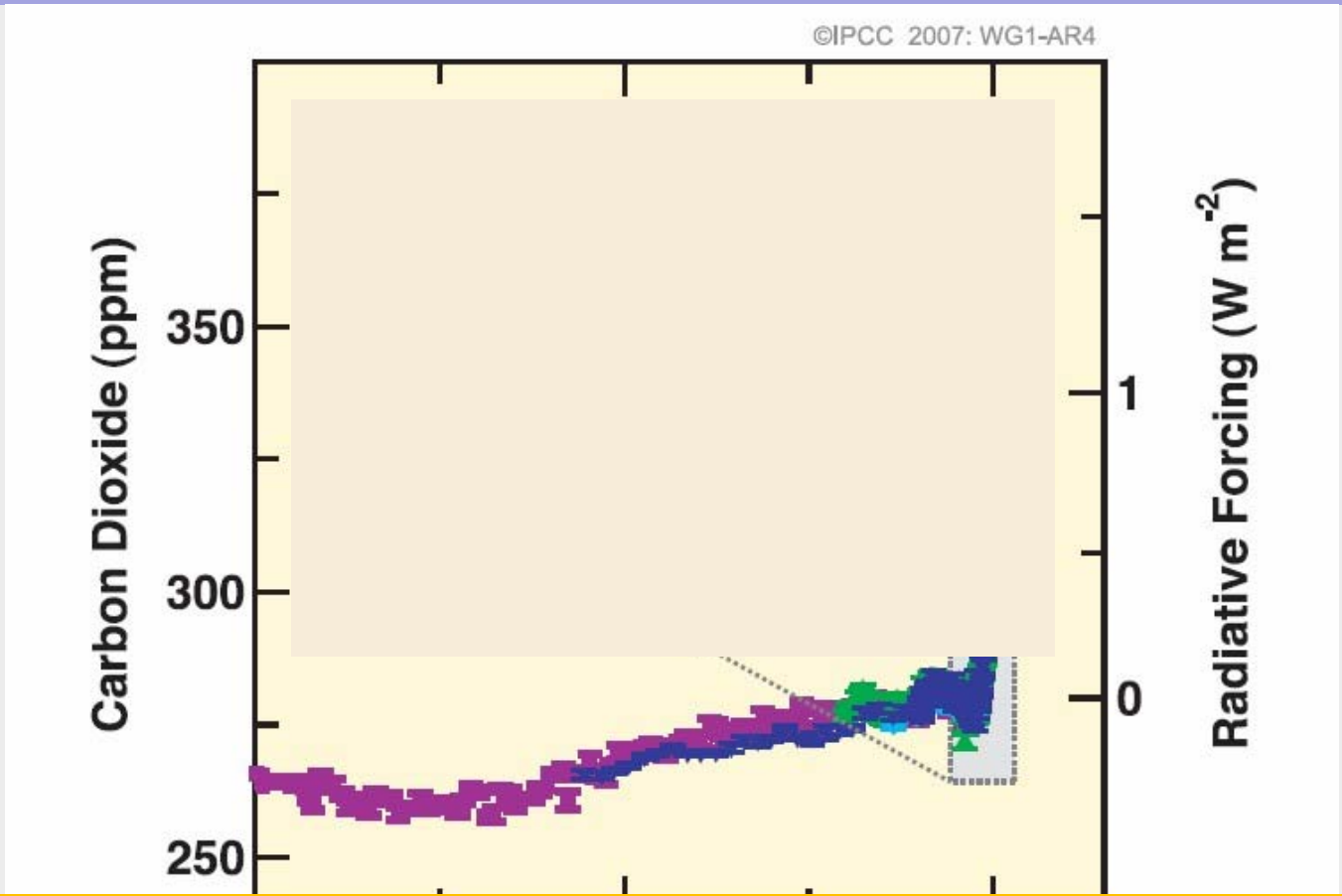
CDM	CCX	GE AES GHG Services
Selecting the Baseline Scenario : Step 1: Identify technically feasible options for capturing and/or using CBM or CMM or VAM; Step 2: Eliminate baseline options that do not comply with legal or regulatory requirements; Step 3: Formulate baseline scenario alternatives; Step 4: Eliminate baseline scenario alternatives that face prohibitive barriers. Establish a complete list of barriers that would prevent identified baseline scenario alternatives to occur in the absence of the CDM.	**No explicit guidelines on establishing baseline.** Q: What is the emission baseline for these projects? A: The emission baseline (the "without project" scenario) assumes that the methane that is captured by the gas collection/combustion system would have otherwise been vented to the atmosphere in the absence of the project activity.	"[C]are must be taken to ensure that the baseline represents the conditions of the mine in a pre-project situation. [B]aseline methane emissions must be known or can be reasonably estimated for a period of one year prior to the accounting period." **Selecting the Baseline Scenario:** Step 1: Identify possible baseline scenarios from the scenarios already identified in Section 5.1 Step 2: From the list of potential baseline scenarios resulting from Step 1, select and justify the scenario that best represent the pre-project condition at the mine. Step 3: see next slide

Additionality

CDM	CCX	GE AES GHG Services
Establish a complete list of barriers that would prevent identified baseline scenario alternatives to occur in the absence of the CDM: **Investment barriers inter alia:** • Debt funding is not available for this type of innovative project activity; • Neither access to international capital markets, nor sufficient ODA can be allocated to finance the considered project alternatives. **Technological barriers, inter alia:** • Skilled and/or properly trained labour to operate and maintain the technology is not available and no education/training institution in the Host country provides the needed skill, leading to equipment disrepair and malfunctioning; • Lack of infrastructure for implementation of the technology. **Barriers due to prevailing practice, inter alia:** • The project activity is the "first of its kind": No project activity of this type is currently operational in the host country or region.	What "additionality" rules are applied to define eligible projects? A: Projects must be surplus to U.S. regulation and must be placed into operation on or after January 1, 1999	Step 3: As per the GE AES Greenhouse Gas Services Standard of Practice, the baseline scenario must be beyond what is required by law, regulation, legal obligation, or common industry practice. If the pre-project conditions at the project site are less conservative than what is **required by law, regulation, legal obligation, or common industry practice then the baseline scenario selected must be at least as stringent as what is required by law,** regulation, legal obligation, or common industry practice.

The Future: Climate Change

The Challenge

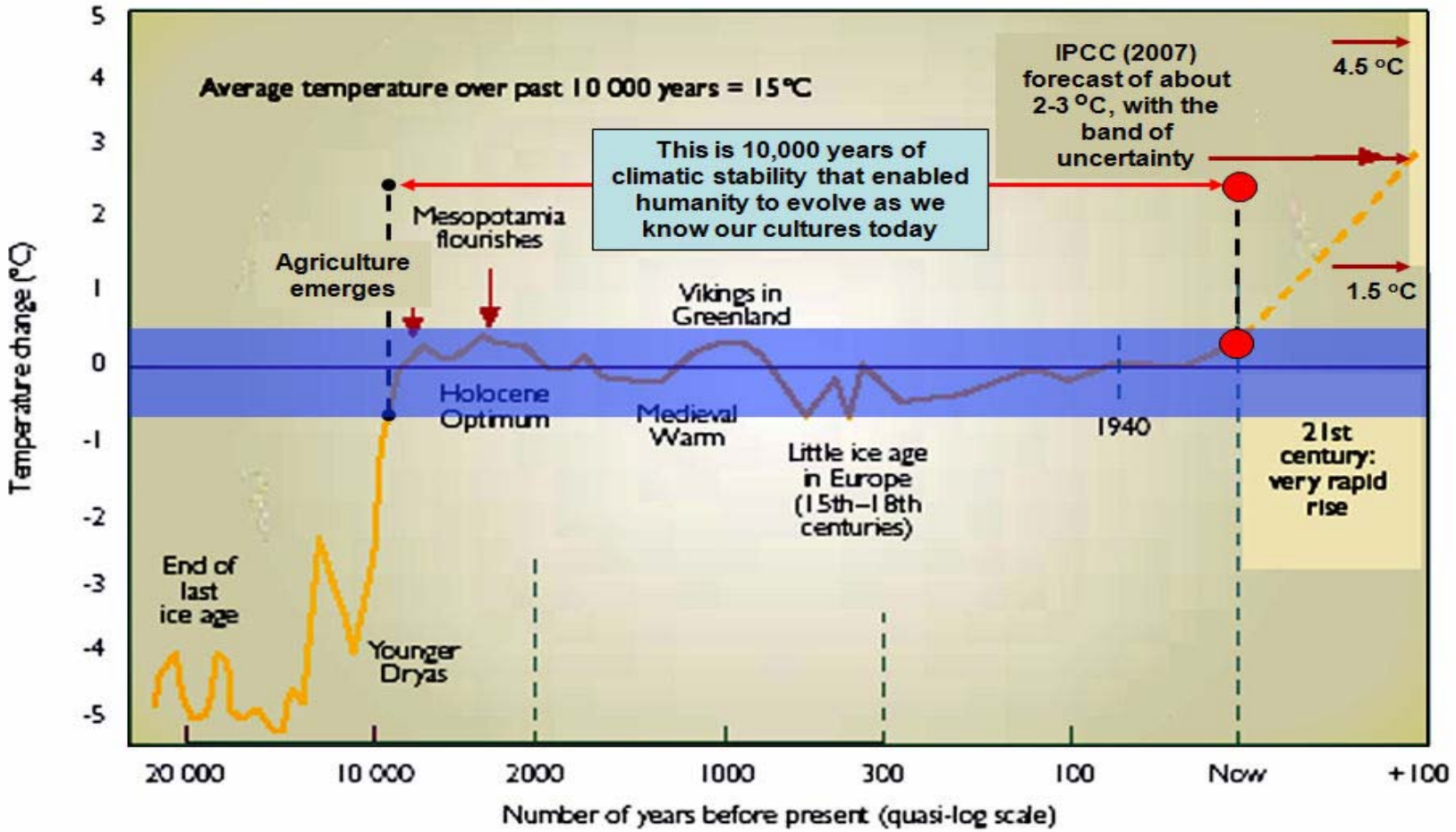


The present atmospheric carbon dioxide (CO2) concentration is the highest during the last 650,000 years and probably during the last 20 million years.

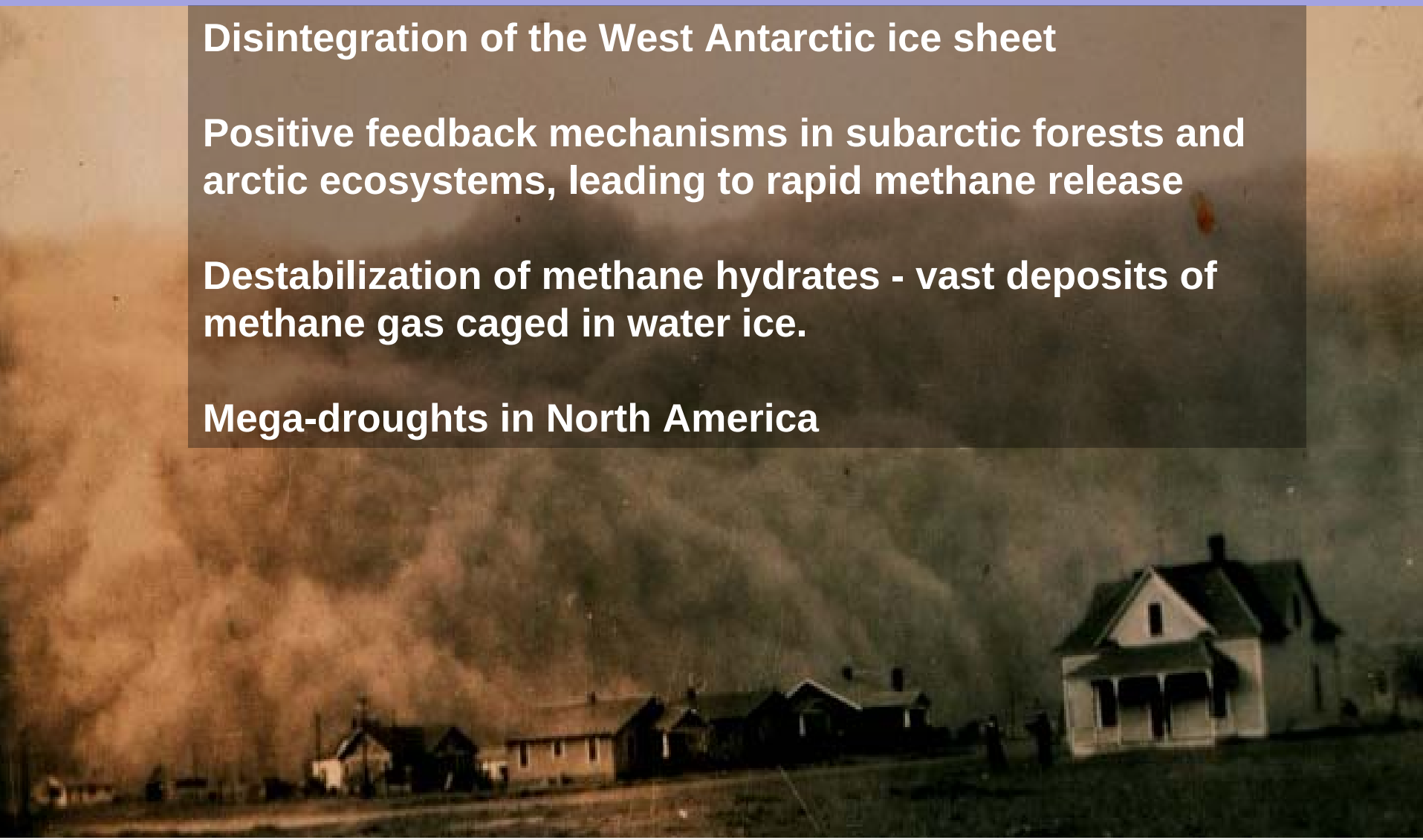
(Global Carbon Project, *Carbon Budget 2007*)

The Challenge

The Last 20,000 Years seems to have been Ideal for the Development of Human Societies. Is this a Historic "Sweet Spot" that Enabled Humans to Flourish?



"The Four Horsemen of the Apocalypse."



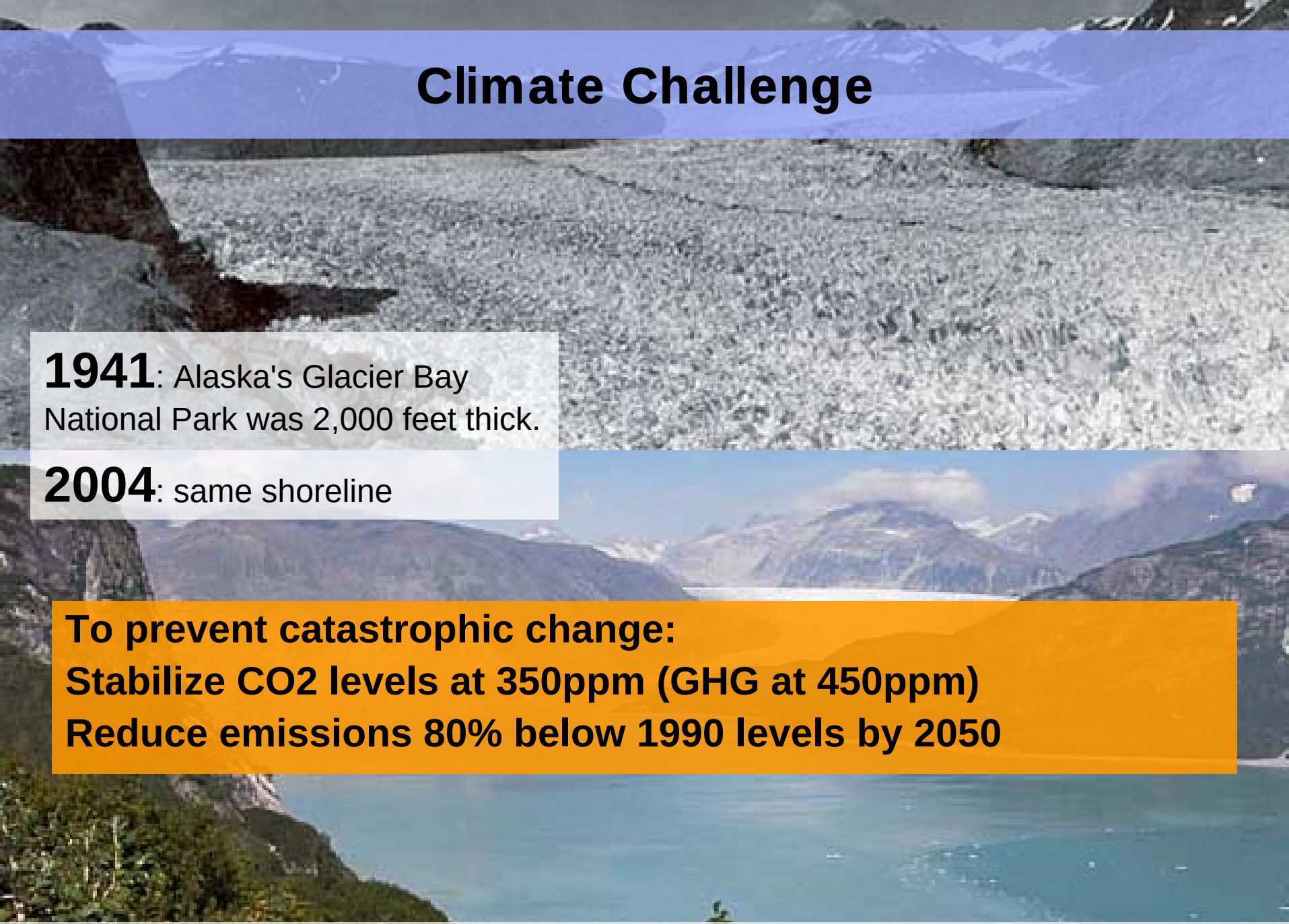
Disintegration of the West Antarctic ice sheet

Positive feedback mechanisms in subarctic forests and arctic ecosystems, leading to rapid methane release

Destabilization of methane hydrates - vast deposits of methane gas caged in water ice.

Mega-droughts in North America

Climate Challenge



1941: Alaska's Glacier Bay National Park was 2,000 feet thick.

2004: same shoreline

To prevent catastrophic change:
Stabilize CO2 levels at 350ppm (GHG at 450ppm)
Reduce emissions 80% below 1990 levels by 2050

Photos: 1941: courtesy of U.S. Geological Survey; 2004: National Park Service photo by Bruce Molina

The Future: Mitigation Policies

Climate Mitigation Policies

Carbon Tax
Cap and Trade
Regulation
Efficiency Standards
Building Codes
Tax Incentives
Subsidies
Offsetting
…

Cap-and-Trade Proposals in the 110th Congress

Bill	Scope of Coverage	2010-2019 Cap	2020-2029 Cap	2030-2050 Cap
Lieberman – Warner (S. 2191)	All 6 GHGs Economy wide – upstream for transport fuels & natural gas; downstream for large coal users; separate cap for HFC consumption	4% below 2005 level in 2012	19% below 2005 level in 2020	71% below 2005 level in 2050
Bingaman – Specter (S. 1766)	All 6 GHGs Economy wide – upstream for natural gas & petroleum; downstream for coal	2012 level in 2012	2006 level in 2020	1990 level in 2030 President may set long-term target ≥60% below 2006 level by 2050 contingent upon international effort
McCain – Lieberman (S. 280)	All 6 GHGs Economy wide – upstream for transportation sector; downstream for electric utilities & large sources	2004 level in 2012	1990 level in 2020	20% below 1990 level in 2030 60% below 1990 level in 2050
Sanders – Boxer (S. 309)	All 6 GHGs Economy wide – not specified	2010 level in 2010 2% per year reduction from 2012-2020	1990 level in 2010	27% below 1990 level in 2030 53% below 1990 level in 2040 80% below 1990 level in 2050
Kerry – Snowe (S. 485)	All 6 GHGs Economy wide – not specified	2010 level in 2010	1990 level in 2020 2.5% per year reduction from 2020-2029	3.5% per year reduction from 2030-2050
Olver – Gilchrest (H.R. 620)	All 6 GHGs Economy wide – upstream for transportation sector; downstream for electric utilities & large sources	2004 level in 2012	1990 level in 2020	22% below 1990 level in 2030 70% below 1990 level in 2050
Waxman (H.R. 1590)	All 6 GHGs Economy wide – not specified	2009 level in 2010 2% per year reduction from 2011-2020	1990 levels in 2020 5% per year reduction from 2020-2029	5% per year reduction from 2030-2050 80% below 1990 levels in 2050

Source: Modified from Pew Center on Global Climate Change, *Comparison of Economy-Wide Cap-and-Trade Proposals in the 110th Congress* (January 2008) www.pewclimate.org

The Future of Coal

Coal and Climate Change Facts

- 20% of global GHG emissions.
- Highest per BTU carbon emissions of all fossil fuels.
- 50% of the electricity generated in the US is from coal.
- 27% of total U.S. GHG emissions,
- Projected to grow by a third by 2025.

- Coal is cheap.
- U.S. coal reserves last well over 250 years.

Carbon Capture and Storage

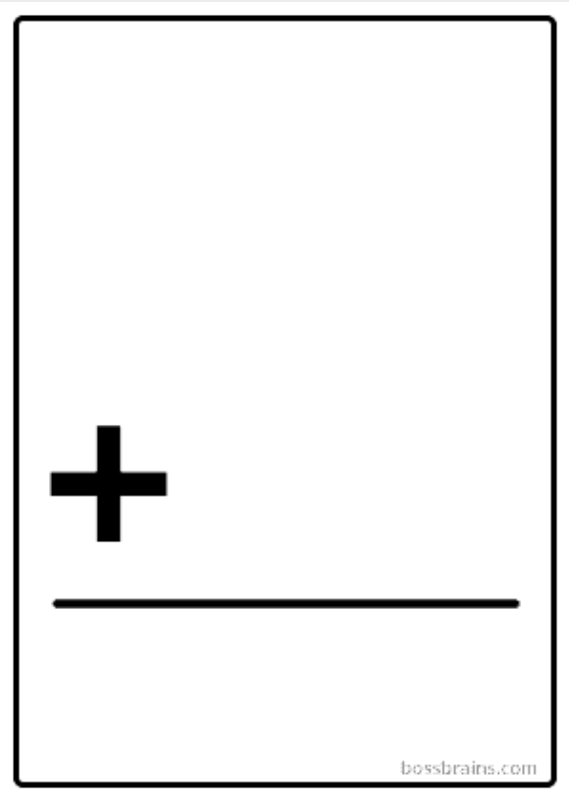
GAO investigators cited underdeveloped and costly emissions-capture technology and legal uncertainties about the permitting and liability for CO2 that would be stored underground.

"GAO officials also concluded that widespread deployment of CCS is unlikely to happen unless Congress passes binding limits on carbon dioxide emissions.“

McKinsey: Cost of capturing and storing carbon emissions from power plants and industrial installations could become commercially viable by 2030, according to a report published today from consultants.

The Future: Offsets

Offsets, Cap or Regulation?



Additionality

Additionality intrinsic weakness offsetting.

Cap-and-trade systems, or purely regulatory action, avoid the issue of additionality altogether.

Criticism of carbon offsetting

- **Carbon Offsets Stifle Action in Other Sectors**
- **Additionality Issues cannot be resolved**
- **Unbalanced Market Dynamics and Free Riders**
- **Negative Impacts on Future Policies**
- **Lack of Development Benefits**

Climate Mitigation Policies

The question is not: Would this be a good offset project? But:

What is the best policy to address the climate challenge?

Maximizing Role Of Offsetting

- **Transitional tool**
- **For sectors that are difficult to cover under cap**
- **One component of a comprehensive mitigation policy strategy**

Contact Information

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